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August 21, 2006

RESPONSE TO NOTIFICATION OF NON-COMPLIANT APPEAL BRIEF

In re application of:	**Group No. 1754**
Vladimir Fridman, et al.	
	Examiner: Cam N. Nguyen
Serial No. 10/680,544	
	Confirmation: 4997
Filing Date: October 7, 2003	
Attorney Docket No. P-1187	
For: CATALYST FOR DEHYDROGENATION OF HYDROCARBONS	

Mail Stop Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

The USPTO asserts that the Appeal Brief that was filed in response to the Final Office Action of the USPTO was "non-compliant" for failure to present arguments under separate headings for each ground of the rejection. In response thereto the applicants has amended the Appeal Brief and attach a revised Appeal Brief to this document.

The applicants assert that this revised Appeal Brief meets with all the criteria of the USPTO. However, if there are any questions, please contact applicants' counsel.

Respectfully Submitted,

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IN THE UNITED STATES PATENT & TRADEMARK OFFICE

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APPEAL BRIEF

This Brief is in furtherance of the Notice of Appeal filed on May 5, 2006. The fees required under Section 41.20 and any required Petition for Extension of Time for filing the Brief and fees thereof are dealt with in the accompanying Transmittal of Appeal Brief.

I. REAL PARTY IN INTEREST

The real party in interest in this Appeal is Süd-Chemie Inc. for whom an assignment of the inventors' interests was filed and recorded with the USPTO on October 7, 2003, at reel/frame 014599/001.

II. RELATED APPEALS AND INTERFERENCES

With respect to any other appeals or interferences that will directly affect or be directly affected by, or will have a bearing on the Board's decision in this Appeal, there are no such appeals or interferences.

III. STATUS OF CLAIMS

A. Total number of claims. The claims remaining in the application are Claims 1 - 8, 10 - 13, 15 - 20, 24 and 27 - 28.

B. Status of all Claims.

1. Claims cancelled. Claims 9, 14, 21 - 23, 25 and 26 were cancelled in Responses to previous Office Actions that pre-dated the Final Office Action filed by the United States Patent and Trademark Office on February 7, 2006. ("Final Office Action") (The Final Office Action is the Office Action from which Applicants appeal.)

2. Claims withdrawn from consideration but not cancelled: none.

3. Claims objected to: none.

4. Claims allowed or confirmed: none.

5. Claims rejected: Claims 1 - 13, 15 - 19, 24 and 27 - 28. Please note that on Form PTOL 326, the Final Office Action does not list Claim 9 as cancelled and does list Claim 20 as cancelled. Both of these statements are in error.

C. Claims on appeal. The claims on appeal are Claims 1 - 8, 10 - 13, 15 - 20, 24 and 27 - 28.

IV. STATUS OF AMENDMENTS

There were no amendments filed in response to the Final Office Action of the United States Patent and Trademark Office dated February 7, 2006.

V. SUMMARY OF CLAIMED SUBJECT MATTER

The independent claims on appeal are Claims 1, 13, 15 and 24. Applicants acknowledge that the patentability of the invention is dependent on the patentability of these independent claims, particularly Claims 1 and 13.

Claim 1.

The subject matter of all four independent claims is catalysts for use in stationary or fluid bed dehydrogenation processes for converting hydrocarbons to olefins and/or diolefins. This subject matter is contained in the preamble of Claims 1 and 13. Basis for this subject matter is contained on page 1, lines 8 - 11, page 7, lines 1 -4 and 12 - 15 and page 8, lines 7 - 9 of the application at issue. (All further references to "pages" and "lines" are to disclosures in the application at issue.) Note that each independent claim contains "consisting essentially of" transitional language.

Independent Claim 1 claims four important elements of this dehydrogenation catalyst: a) a carrier, b) chromium, as a promoter, c) zirconium, as a promoter, and d) magnesium, as a promoter. These four elements of the composition of the catalyst are disclosed on page 1, lines 11 - 15 and page 7, lines 1 - 4. The concept of the use of the carrier of the claimed catalyst is also disclosed at page 7, lines 1 - 4, with specific disclosures of the recommended choices for the carrier at page 8, lines 14 through

page 9, line 10. The presence of chromium, as a promoter on this catalyst, and the percentage by weight ranges for that chromium that are claimed in Claim 1 are disclosed at page 9, lines 11 - 21. The presence of zirconium, as a promoter, on this catalyst and the percentage by weight ranges for the zirconium that are claimed are disclosed at page 11, line 18 through page 12, line 9. Finally, the presence of magnesium, as a promoter, on this catalyst and the percentage by weight ranges for the magnesium that are claimed are disclosed at page 12, lines 10 - 20. Claim 1 uses "consisting essentially of" transitional language.

Claim 13.

Independent Claim 13 adds to the composition of the catalyst claimed in Claim 1 an alkali metal promoter selected from sodium, potassium and mixtures thereof, along with particular weight percentages for this alkali metal promoter. Support for this additional subject matter is contained on the page 10, line 10 through page 11, line 14. The remaining subject matter of Claim 13 is claimed in Claim 1. Claim 13 also uses "consisting essentially of" transitional language.

Claim 15.

Independent Claim 15 is similar to Claim 1. Claim 15 adds to the subject matter of Claim 1 a description of preferred carriers and certain characteristics of those carriers. Basis for these preferred carriers, their range of surface areas, volumes and

average pore diameter that are claimed is contained on page 8, line 14 through page 9, line 10. Additional subject matter added to Claim 1 in claim 15 also includes different weight concentrations for chromium, as a promoter. Basis for this subject matter is contained on page 9, line 21 through page 10, line 2. Particular sources for the chromium promoter are also claimed in Claim 15. Basis for this subject matter is contained on page 9, lines 15 - 18. The upper weight limitation for the zirconium component that is claimed in Claim 15 is also changed from the weight limit claimed in Claim 1. This new upper weight limitation is disclosed at page 12, lines 2 - 6. The description of the magnesium promoter and its upper weight limit in Claim 15 is also changed from what is claimed in Claim 1. Basis for this new limitation is contained at page 12, lines 10 - 20. Claim 15 also uses "consisting essentially of" transitional language.

Claim 24.

Independent Claim 24 adds limitations to independent Claim 13. Both independent Claim 13 and independent Claim 24 claim a dehydrogenation catalyst "consisting essentially of" five components: a carrier, chromium, zirconium, magnesium, and an alkali metal promoter. In addition to the limitations claimed in Claim 13, Claim 24 claims types of carriers and ranges for their surface area, pore volume, average pore diameter, and method of production. Basis for these limitations is contained on page 8,

line 14 through page 9, line 10. The source of the chromium for the catalysts of this claim and its methods of impregnation onto the carrier are newly claimed in Claim 24. Basis for this limitation is contained on page 9, line 11 through page 10, line 9. The particular alkali metal promoters and their concentrations are newly claimed in Claim 24. Basis for this limitation is contained on page 10, line 10 through page 11, line 14. Finally, claimed methods for introduction of the magnesium to the catalyst by co-impregnation are newly claimed in Claim 24. Support for this limitation is contained on page 12, lines 6 - 9 and 19 - 20.

The subject matter of the Appeal is contained in the four independent claims, Claims 1, 13, 15 and 24. In a previous amendment in response to a USPTO Office Action, the transitional language of all of these claims was amended from "comprising" to "consisting essentially of". The impact of this transitional language on the rejection of the claims by the Examiner should also be considered during this Appeal.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

1. Claims 1 - 2, 5 - 8, 10 - 13, and 28 stand rejected under 35 USC §103 as being obvious over Zimmerman, et al. (U.S. Patent No. 5,378,350) taken together with Kerby, et al. (U.S. Patent No. 5,258,567).

2. Claims 3 - 4, 15 - 19, 24 and 27 stand rejected under 35 USC §103 as being obvious over Zimmerman, et al. (U.S. Patent No. 5,378,350) taken together with Kerby, et al. (U.S. Patent No. 5,258,567) as applied to Claims 1 - 2, 5 - 8, 10 - 13, and 28, and further in view of Hamner, et al. (U.S. Patent No. 4,212,771). (Presumably Claim 20 is also rejected for these same grounds.)

VII. ARGUMENTS

1. Rejection of Claims 1 - 2, 5 - 8, 10 - 13 and 28 under 35 USC §103 based on Zimmerman, et al. taken together with Kerby, et al.

Rejections of Claims 1 - 2, 5 - 8 and 10 - 12.

Claim 1 is the first independent claim of the application. Claims 2 - 8 and 10 - 12 are dependent claims depending upon the patentability of independent Claim 1. Applicants acknowledge that the patentability of these dependent claims is dependent upon the patentability of independent Claim 1.

Introduction

The applicants have discovered a new dehydrogenation catalyst which is particularly useful for vapor phase dehydrogenation. The catalyst consists essentially of chromium oxide on a carrier with two promoters, zirconium and magnesium.

The prior art teaches that many dehydrogenation catalysts contain chromium oxide on a carrier, such as alumina. The applicants have surprisingly discovered that the performance of this type of dehydrogenation catalyst can be improved by the addition as promoters of both zirconium and magnesium. The mere addition of either zirconium or magnesium alone does not result in the significant improvements that are achieved by the catalyst of the invention. The applicants have surprisingly discovered that there is a symbiotic relationship when both zirconium and magnesium are added to the catalyst as promoters. By adding both magnesium

and zirconium as promoters, the resulting catalyst exhibits higher selectivity and higher olefin yield, especially after ageing. This enhancement in selectivity and yield after ageing is confirmed by the results shown in Table 1, page 20 of the application, where the inventive catalyst is compared with catalysts prepared containing only magnesium, as a promoter (Comparative Example 2) or only zirconium, as a promoter (Comparative Example 3) of conventional chromium on alumina catalysts. It is important to note that the improvements in the performance of the inventive catalyst occurs even after an alkali metal, such as sodium, is added to the catalyst. (See Examples in application.) Thus, the key improvement to the inventive catalyst over prior art catalyst is the addition of magnesium as a promoter, with or without the addition of an alkali metal promoter, such as sodium.

The improvement in the performance of the inventive catalyst when both zirconium and magnesium are added was significant. This improvement was especially apparent after ageing. By rejecting the claims only under 35 U.S.C. §103, the Examiner acknowledges that this particular choice of promoter components has not been previously disclosed in a single prior art reference. The applicants assert that this composition for a catalyst is also unobvious.

Examiner's position.

The Examiner asserts that while the invention, as claimed, is

not directly disclosed by any specific prior art reference, it is obvious based on the combination of Zimmerman, et al., (U.S. Patent No. 5,378,350) taken together with Kerby, et al. (U.S. Patent No. 5,258,567). To understand this rejection, it is first necessary to review the teachings of Zimmerman, et al. and Kerby, et al., focusing particularly on the combination of these references.

The Examiner asserts, and the applicants agree, that Zimmerman, et al. discloses a dehydrogenation catalyst comprising an alumina carrier onto which chromium is added as a promoter. Additional preferred promoters added by Zimmerman, et al. include zirconium and cesium. (Col. 2, lines 15 - 17 and 25 - 29) The addition specifically of cesium as a promoter was the basis for issuance of this patent. Further, the use of cesium, as a promoter, is specifically preferred over all other alkali metals or alkaline earth metals. As stated by Zimmerman, et al. at col. 6, lines 50 - 52,

> Further, it can be seen from table I that cesium compounds, in comparison with the other alkalis and alkaline earths, prevent the coke formation most effectively.

To further define the precise composition of their novel catalyst, Zimmerman, et al. claimed in all claims a catalyst or a process for use of that catalyst containing the same exact four components: aluminum oxide, chromium, zirconium and cesium. (See Claims 1 - 18)

Accordingly, the differences between the catalysts disclosed by Zimmerman, et al. and the catalysts of the invention are that

Zimmerman, et al. do not disclose the use of magnesium, as a promoter, and its concentration and Zimmerman, et al. require the addition of cesium as a promoter for their catalyst. (The Examiner acknowledges these differences at page 4, first full para. of the Final Office Action.) Thus, when comparing the teaching of independent Claim 1 of the application with that of Zimmerman, et al., it is acknowledged that Zimmerman, et al. fail to teach the combination of magnesium with zirconium as co-promoters on a chromium-based dehydrogenation catalyst. In fact, Zimmerman, et al. teach away from the use of magnesium, as a promoter with zirconium by requiring cesium to be added as a promoter instead of any alkaline earth metal. In Table I of Zimmerman, et al. at col. 6, Zimmerman, et al. compare the performance of a number of catalysts where the only difference is the identity of the second promoter. In the results shown in Table 1, cesium performed better than any of the other promoters on this list. Among the promoters are barium and calcium, both alkaline earth metals. In fact Zimmerman, et al. thought so little of the potential utilization of magnesium that magnesium was not even tested as a possible promoter. A person skilled in the art reviewing Table I of Zimmerman, et al. would recognize that cesium was preferred over not only other alkali metals, but all alkaline earth metals, particularly magnesium. In fact, Zimmerman, et al. specifically assert that their catalyst containing cesium is more "effective"

than catalysts containing "other alkalis and alkali earths...". Thus, Zimmerman, et al. not only fail to teach the addition of magnesium as a promoter for their catalyst, but, in fact, they teach that adding any alkaline earth metal or any alkali metal without also adding cesium produces a catalyst with lower performance and thus, a less useful catalyst.

In order to overcome these acknowledged deficiencies in Zimmerman, et al., the Examiner asserts that it would be *prima facie* obvious to add magnesium to the catalyst of Zimmerman, et al. based on the disclosure of Kerby, et al. Kerby, et al. also discloses a dehydrogenation catalyst. However, its composition is significantly different from that of either the catalysts as claimed in the application or the catalysts of Zimmerman, et al. The catalysts that are disclosed by Kerby, et al. contain "a pillared mica catalyst which contains an active metal selected from the group consisting of Pt, Cr and mixtures thereof, and a first modifier metal selected from the group consisting of Sn, Ga and mixtures thereof." (Abstract) To this composition "may" be added a second modifier selected from the group consisting of alkali metals, alkaline earth metals, and rare earth metals, and mixtures thereof. (Abstract; col. 2, lines 22 - 26) Note that this addition of this second modifier to the catalyst of Kerby, et al. is only optional.

As magnesium is an alkaline earth metal, the Examiner asserts

that Kerby, et al. teach to a person skilled in the art to add magnesium as a modifier to the catalyst of Zimmerman, et al. Magnesium is merely one of 27 elements that may, but is not required, to be added to the Kerby, et al. catalyst. Notwithstanding this disclosure in Kerby, et al., and notwithstanding other significant differences between the dehydrogenation catalyst of Kerby, et al. and the catalyst of Zimmerman, et al., the Examiner asserts that Kerby, et al. teach the addition of magnesium as a promoter for a dehydrogenation catalyst. The Examiner then combined that asserted teaching of Kerby, et al. with the acknowledged disclosures of Zimmerman, et al. and argued that the invention, as claimed in Claim 1, is disclosed. Whether the combination of these references is proper and whether the combination of the actual teachings of these references teaches the invention, as claimed in Claim 1, creates the issue before this Board.

Obviousness Analysis

The issue of "obviousness" is one of the most frequently litigated issues before this Board. Applicants recognize that there is no need to restate well recognized guidelines for determining "obviousness." Notwithstanding, the applicants assert that the requirements for proof of obviousness have not been satisfied. Applicants assert that the mere combination of one reference that

discloses some of the elements of an invention with another reference that allegedly discloses the remaining elements of an invention with no proof of motivation to combine those references is not sufficient to teach the invention.

This type of simplistic combination of references is particularly improper when the composition, as claimed, is a catalyst. The Courts and the USPTO have long recognized that "catalytic effects are not ordinarily predictable with certainty". In re: Doumani and Huffman, 126 USPQ 408, 410 (CCPA 1960); see In re: Slocombe, 184 USPQ 740, 740 (CCPA 1971). Thus, for claims of catalysts, obviousness is not proved merely by finding two references that mention all of the elements of the composition of the claimed catalyst. For example, in one case the Courts stated that it was not obvious that elements even in the same group of the Periodic Chart will react in the same way when incorporated into a catalyst. In In re: Doumani and Huffman, the Court concluded that "merely because both platinum and rhodium are included in the list does not in our opinion necessarily establish any close relationship between them, or indicate a likelihood that they would be generally equivalent as catalyst." Thus, when the composition at issue is a catalyst, it is especially important that the USPTO satisfies each and every element of proof of obviousness.

The standards for determining obviousness are well recognized and require the USPTO to consider two questions and answer both

favorably before obviousness is proved: 1) whether the prior art would have suggested to a person skilled in the art that they should make the claimed composition, and 2) whether the prior art would also reveal that in making or carrying out the invention, those of ordinary skill would have had a reasonable expectation of success in making the inventive product.

In satisfying the first requirement, the USPTO must recognize the "problem to be solved" and then find the "teaching, suggestion, or motivation" in the prior art which would lead one of ordinary skill in the art to select the specific teachings of particular references and combine them to produce the claimed combination. Karsten Mfg. Corp. v. Cleveland Golf Co., 242 F.3rd 1376, 1385 (Fed. Cir. 2001). (See MPEP 2143.01 III.) The necessity of proof of this "motivation to combine" references prevents a hindsight bias on the part of the USPTO. Medichem S.A. v. Rolabo S.L., 77 USPQ 2nd 1865, 1869 (Fed. Cir. 2006).

Proof of obviousness requires not only this motivation to combine the elements of the respective references, but also proof that a skilled artisan would have reasonably expected success in making the invention by that chosen combination. To have this "reasonable expectation of success", it is necessary that the party skilled in the art be taught by the references more than merely to "vary all parameters or try each of numerous possibly choices until one possibly arrived at a successful result, where the prior art

gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful." Medichem S.A. v. Rolabo S.L., id. at 903, citing In Re: O'Farrell, 853 Fed 2nd 893, 903-04 (Fed. Cir. 1988). The mere teaching of a "general approach that seemed to be a promising field of examination, where the prior art only gave general guidance as to the particular form of the claimed invention...." is not sufficient to prove a motivation to combine reference. (Medichem S.A. id.) Failure to provide more than a "general approach" to the particular form of the invention dooms the obviousness assertion.

Applying this standard to the combination of references that was made by the Examiner in this case requires an analysis of whether a person skilled in the art would have perceived a "problem" in the catalyst of Zimmerman, et al. for which there was a reasonable expectation of success to make the applicants' catalyst from a combination of the teachings of Zimmerman, et al. with Kerby, et al. Further, before it is even determined whether a person skilled in the art would have had a reasonable expectation of success, the USPTO must prove that a skilled person would have been motivated to do more than merely vary the "parameters" that were disclosed by Kerby, et al. and to try every possible choice that was disclosed by Kerby, et al. until that person arrived at the particular result claimed by the applicants. Specifically, the Examiner must show that Kerby, et al. or Zimmerman, et al. provide

a "clear and particular" motivation or suggestion (In re: Dembiczak, 175 Fed 3rd 994, 1000 (Fed. Cir. 1997)) to a person skilled in the art to glean from the teaching of Kerby, et al. or Zimmerman, et al. that the "problem to be solved" would be solved by the addition of magnesium to the catalyst of Zimmerman, et al. Further, because the transitional phrase "consists essentially of" is present in Claim 1, it is also necessary that the person skilled in the art must have been taught by Kerby, et al. not to add any additional significant components to the catalyst of Zimmerman, et al., even if those components are required by the teaching of Kerby, et al. Finally, the person skilled in the art reviewing the disclosures of Kerby, et al. and Zimmerman, et al. must have been motivated not to use cesium as a promoter on the catalyst of Claim 1, even though the use of cesium was the key element of the catalyst of Zimmerman, et al.

Upon a careful analysis of the disclosures and teachings of Kerby, et al. and Zimmerman, et al., it is clear that the standard for proof of obviousness required by the Courts and the USPTO has not been met. The applicants respectfully assert that no person skilled in the art reviewing the teachings of Kerby, et al. with those of Zimmerman, et al. would have been motivated to add magnesium, as a promoter, to a catalyst already containing alumina with chromium and zirconium as promoters. Magnesium is merely one of 27 possible options for additional modifiers that are disclosed

by Kerby, et al. In fact, Kerby, et al. teaches that any of the alkali, alkaline earth or rare earth elements could be used as a second modifier, without preferring one over the other. As stated above, it is not sufficient to prove motivation to merely "vary all parameters or try each of numerous possible choices until one possibly arrived at a successful result, where the prior art gave either no indication of which parameters were critical or no direction as to which of many possible choices is likely to be successful." In re: O'Farrell, supra.

In the Office Action at p. 6, the Examiner asks, "...why wouldn't Zimmerman pick Mg as a modifier for modifying his catalyst?" The answer is simple and only requires one word: Results! Table I of Zimmerman, et al. shows that Cs compounds works better than all other alkali or alkaline earth compounds (including Mg). Where is the motivation for Zimmerman, et al. to choose Mg over Cs when the results showed improved performance from the use of cesium compounds? That is why Zimmerman, et al. would not have picked Mg over Cs!

What makes this lack of motivation to combine these references even more clear is the disclosure of Zimmerman, et al. Zimmerman, et al. teach that the preferred alkali or alkaline earth metal promoter for a dehydrogenation catalyst is a cesium compound. In fact, Zimmerman, et al. prefers cesium over any of the other alkalis and alkaline earth compounds.

> Further, it can be seen from Table I that cesium compounds, in comparison with other alkalis and alkaline earths, prevent the coke formation most effectively. (Zimmerman, et al., col. 6, lines 50 - 52.)

Thus, not only does Kerby, et al. provide no motivation to add magnesium to the dehydrogenation catalyst that is taught in Zimmerman, et al., but Zimmerman, et al. teaches away from such addition. Thus, Zimmerman, et al. teaches away from the addition of a specific element that is essential to the applicants' invention i.e. magnesium.

A similar factual pattern to that of this Appeal existed in Winner International Royalty Corp. v. Wong, 53 USPQ 2nd 1500 (Fed. Cir. 2000). In that case the issue was whether the primary reference, "Johnson", could be combined with the secondary reference, "Moore" to prove obviousness. In Winner International, the primary reference taught away from the disclosure in Moore that was necessary for proof of obviousness. The Court concluded that

> ... if Johnson did in fact teach away from Moore, then that finding alone can defeat [the] obviousness claim.... A reference will teach away if it suggests that the line of development flowing from the reference's disclosure is unlikely to be productive of the result sought by the applicant. (Winner International, 53 USPQ 2nd at 1587)

(See also MPEP 2145 X.D.2.) In the same way as in Winner International, Zimmerman, et al. teach, in fact require, the use of cesium as the alkali or alkaline earth promoter for the catalyst and thus teach away from the use of any other alkali or alkaline

earth element, such as magnesium. Thus, regardless of what is taught by Kerby, et al., and the applicants do not acknowledge that Kerby, et al. teach the addition of magnesium, the combination of these references cannot teach the addition of magnesium, as a promoter, as Zimmerman, et al. teach that the only alkali or alkaline earth compound that should be added is a cesium compound.

The "nature of the problem" faced by Zimmerman, et al. was which alkali or alkaline earth compound could be added to a conventional dehydrogenation catalyst to achieve enhanced performance. The solution by Zimmerman, et al. was to add a cesium compound. Zimmerman, et al. perceived no disadvantage from this solution to their problem. The solution asserted by the Examiner as being taught by Kerby, et al. is clearly different from the solution conceived of by Zimmerman, et al. In fact, the solution proposed by the Examiner teaches away from the solution discovered by Zimmerman, et al.

It is clear that the Examiner has merely used "hindsight" to combine references. The Examiner has chosen magnesium, even though it is only 1 of 27 elements disclosed in Kerby, et al., and combined that element with the other components of the catalyst of Zimmerman, et al., even though Zimmerman, et al. preferred cesium to any other alkali or alkaline earth elements, as a second promoter. This type of hindsight analysis is not permitted. At best the cited references suggest an "obvious to try" analysis,

which is not sufficient to prove obviousness. See In re: Geiger, 2 USPQ 2nd 1276, 1278 (Fed. Cir. 1987).

Not only does the combination of Kerby, et al. with Zimmerman, et al. not teach that magnesium must be added as a promoter, there are additional catalyst modifiers that are required to be added by Kerby, et al. that play no role in the applicants' invention. For example, Kerby, et al. require a modifier metal "selected from the group consisting of Sn, Ga and mixtures thereof" (Abstract). Clearly neither Sn nor Ga are elements of the composition, as claimed. Accordingly, a person skilled in the art reviewing the disclosure of Kerby, et al. would be taught to add Sn or Ga to the catalyst of Zimmerman, et al. to enhance its performance as a dehydrogenation catalyst. In contrast, the applicants do not include either of these elements in their catalyst composition. Once again the presence of the "consisting essentially of" language results in the failure of the cited references to teach the claims of the application.

In response to the addition of the "consisting essentially of" transitional language to the claims, the Examiner asserts that the applicants must prove that the introduction of elements to the claims that are actually preferred by the inventors of the prior art "would materially change the characteristics of the applicants' composition." Proof of this fact is inherent from the disclosure of Zimmerman, et al. and Kerby, et al. Upon reviewing all alkali

and alkaline earth metals, presumably including magnesium, Zimmerman, et al. concluded that the preferred promoter was cesium. The results shown in Table I of Zimmerman, et al. bear out the decision of Zimmerman, et al. Zimmerman, et al. must have concluded that magnesium would have performed in a manner similar to the other alkali and alkaline earth elements, such as barium and calcium, and therefor, rejected it as a potential promoter for their catalyst. The applicants came to a different conclusion when they chose magnesium even after considering the impact of alkali metals as promoters. With regard to Kerby, et al., they required the addition of either Sn or Ga, elements not included in applicants' invention. Thus, applicants have satisfied their burden to prove a "material change" to their composition if the required composition of Zimmerman, et al. or Kerby, et al. was used.

In conclusion, a person skilled in the art reviewing the combination of Zimmerman, et al. with Kerby, et al. would not have been taught the invention, as claimed. To prove the exact composition of applicants' catalyst, the person skilled in the art would have been required to take the following non-obvious steps after reviewing Zimmerman, et al. and Kerby, et al.: 1) choose magnesium from a list of 27 elements in Kerby, et al. to add to the catalyst of Zimmerman, et al. 2) even though Zimmerman, et al. teach away from this choice by asserting that cesium is preferred over any alkali or alkaline earth metals; 3) not add Sn or Ga to

the catalyst as a modifier, even though their addition is required by Kerby, et al. ; and 4) not introduce cesium as an element of the catalyst, even though cesium is also a required element of Zimmerman, et al.

It is clear from this analysis that Claim 1 and the dependent claims depending thereon are not taught by the combination of Kerby, et al. with Zimmerman, et al.

Rejection of Claims 13 and 28

Claim 13 is an independent claim. Claim 28 is a dependent claim depending on Claim 13. Applicants acknowledge that the patentability of Claim 28 depends on the patentability of Claim 13.

Claim 13 differs from Claim 1 by adding to the composition of the catalyst of Claim 1 an alkali metal promoter selected from the group consisting of sodium, potassium and mixtures thereof and by putting a particular range on the amount of the sodium or potassium promoter that is added.

The Examiner rejected Claim 13 for the same reason as he rejected independent Claim 1. For all of the same reasons as cited for the objection to the rejection of Claim 1, the applicants contest the rejection of Claims 13 and 28.

In addition, while it is true that Zimmerman, et al. disclose that sodium or potassium can be added to a dehydrogenation catalyst as a promoter, it is also clear that the teaching of Zimmerman, et

al. is that cesium is preferred as the promoter over other alkali metals, such as sodium or potassium. Thus, Zimmerman, et al. teach away from the use of sodium or potassium as a promoter.

> When a piece of prior art "suggests that a line of development flowing from the reference's disclosure is unlikely to be productive of the results sought by the applicant" the piece of prior art is said to "teach away" from the claimed invention. Medichem S.A. v. Rolabo S.L., 77 USPQ 2nd at 1870 citing In re: Gurley, 27 Fed 3rd 551, 553 (Fed. Cir. 1994).

While it is true that a single reference that "teaches away" is not conclusive on the issue of non-obviousness, it is also clear that Zimmerman, et al. do not support the addition of sodium or potassium, as a promoter to a dehydrogenation catalyst.

In addition, a person skilled in the art noting that the applicants already added an alkali metal to the composition of their catalyst, as is claimed in Claim 13, would not be taught by Zimmerman, et al. that an alkaline earth metal promoter was also needed for best results.

When these deficiencies in Zimmerman, et al. and Kerby, et al. are added to the earlier arguments concerning non-obviousness of independent Claim 1, it is clear that Claim 13 is also non-obvious over Zimmerman, et al. in view of Kerby, et al.

2. Rejection of Claims 3 - 4, 15 - 19 [and 20], 24 and 27 under 35 USC §103 based on Zimmerman, et al. taken together with Kerby, et al. and further in view of Hamner, et al.

Claims 3 - 4 and 15 - 20

Claim 15 is an independent claim. Claims 16 - 20 are dependent claims depending on Claim 15. Applicants acknowledge that the patentability of these dependent claims is dependent upon the patentability of independent Claim 15.

Claim 15 is similar to Claim 1 in that it requires four elements for the dehydrogenation catalyst namely a carrier, chromium, as a promoter, zirconium, as a promoter, and magnesium, as a promoter. The additional claim language that is added to Claim 15 further defines the carrier, the weight percent that is permitted for the chromium promoter and which types of components can be used for the chromium promoter. Further, the weight percent of both the zirconium and magnesium promoters are more narrow in Claim 15 than in Claim 1. Notwithstanding, the four required components of Claim 15 are the same as in Claim 1. Additionally, Claim 15 contains the same transitional language, "consisting essentially of", that is present in Claim 1.

The Examiner rejected Claims 15 - 19 based on Zimmerman, et al. and Kerby, et al. and further in view of Hamner, et al., (U.S. Patent No. 4,212,771). The Examiner added Hamner, et al. simply to describe further the composition of the carrier. (See p. 5 of

Office Action.) The addition of Hamner, et al. has no impact on any of the other issues in this Appeal. Accordingly, the Examiner makes the exact same argument for the rejection of Claims 15 - 19 as he did for independent Claim 1 and the dependent claims depending thereon.

The applicants believe that the Examiner's rejection of Claims 15 - 19 is improper for the same reasons as stated above for Claim 1 and the dependent claims depending thereon. The applicants' arguments made under the analysis of the rejections based solely on Zimmerman, et al. taken together with Kerby, et al. beginning on page 11 are therefor incorporated herein.

The applicants believe that the Examiner has made an error in stating that Claim 20 has been cancelled, as there is no record of that cancellation. Notwithstanding, the applicants acknowledge that the patentability of Claim 20 depends upon the patentability of independent Claim 15.

Claims 3 and 4

Claims 3 and 4 stand rejected under 35 USC §103 as being obvious over Zimmerman, et al. taken together with Kerby, et al. and further in view of Hamner, et al. as discussed for Claims 15 - 20 above. Claims 3 and 4 are dependent claims depending on Claim 1. Claims 3 and 4 further define the carrier for the catalyst by adding limitations concerning its surface area, pore volume and average pore diameter (Claim 3) and its particle size (Claim 4).

Notwithstanding, the applicants acknowledge that the patentability of these claims is dependent upon the patentability of Claim 1. The applicants adopt the same arguments made under the analysis of the rejection of Claim 1 based on Zimmerman, et al. taken together with Kerby, et al. and incorporate that analysis herein. The applicants asserts that Claims 3 and 4 are also patentable over the references cited.

Claims 24 and 27

Claim 24 is an independent claim. Claim 27 depends on Claim 24. Applicants acknowledge that the patentability of Claim 27 depends on the patentability of Claim 24.

Claim 24 is similar to Claim 13 in that it requires as elements of the invention the following components: a carrier, chromium, an alkali metal, zirconium and magnesium. The additional claim elements that are added to Claim 24 over those in Claim 15 include limitations on the composition of the carrier, limitations of the sources for the chromium and a requirement that the magnesium be coimpregnated on the carrier with the chromium and zirconium. Notwithstanding these differences, the applicants acknowledge that the patentability of Claims 24 and 27 depend on the patentability of independent Claim 13. Accordingly, the applicants incorporate by reference all arguments made under the rejections based solely on Zimmerman, et al. taken together with

Kerby, et al. beginning on page 11. The applicants respectfully assert that Claims 24 and 27 are also non-obviousness over the references cited by the Examiner.

CONCLUSION

The applicants assert that all of the claims of the application are non-obviousness over the references cited by the Examiner, particularly as each of the claims contains limiting transitional language "consisting essentially of". The applicants respectfully request that all remaining claims of the application be allowed.

CLAIMS APPENDIX

Claim 1. A catalyst for use in stationary or fluid bed dehydrogenation processes for converting hydrocarbons to olefins and/or diolefins, said catalyst consisting essentially of:

a carrier; chromium, as a promoter, in the form of Cr_2O_3, at a concentration from about 10 wt% to about 30 wt%, based on the total catalyst weight; zirconium, as a promoter, in the form of ZrO_2, at a concentration from about 0.1 wt% to about 15 wt% zirconium, based on the total catalyst weight; and magnesium, as a promoter, in the form of MgO, at a concentration from about 0.1 wt% to about 15 wt% magnesium, based on the total catalyst weight.

Claim 2. The catalyst of Claim 1 wherein the carrier is selected from a group consisting of aluminum oxide, alumina, alumina monohydrate, alumina trihydrate, transition alumina, gamma-alumina, delta-alumina, eta-alumina, alumina-silica, silica, silicates, zeolites, bayerite, gibbsite, nordstrandite and combinations thereof.

Claim 3. The catalyst of Claim 1 wherein the carrier has a surface area of from about 15 m^2/g to about 300 m^2/g, a pore volume of from about 0.2 cc/g to about 1.5 cc/g, and an average pore diameter of from about 3 nm to about 30 nm.

Claim 4. The catalyst of Claim 1 wherein the carrier has a

particle size of from about 20 μm to about 150 μm.

Claim 5. The catalyst of Claim 1 wherein the carrier comprises an alumina carrier that is spray-dried or pelletized and calcined at a temperature from about 500°C to about 1100°C.

Claim 6. The catalyst of Claim 1 wherein the chromium promoter is derived from a member selected from the group consisting of CrO_3, inorganic chromium salts, ammonium chromate, ammonium dichromate, chromium nitrate, organic chromium salts, and combinations thereof.

Claim 7. The catalyst of Claim 1 wherein the chromium promoter is present in the form of Cr_2O_3 at a concentration from about 15 wt% to about 28 wt%, based on the total catalyst weight.

Claim 8. The catalyst of Claim 1 wherein the chromium promoter is added in the form of a CrO_3 solution that is impregnated onto the alumina carrier.

Claim 9. (Cancelled)

Claim 10. The catalyst of Claim 1 wherein the zirconium promoter is present in the form of ZrO_2 at a concentration of from about 0.5 wt% to about 1.5 wt%, based on the total catalyst weight.

Claim 11. The catalyst of Claim 1 wherein the zirconium promoter is co-impregnated on the carrier with the chromium promoter.

Claim 12. The catalyst of Claim 1 wherein the magnesium promoter is present in the form of MgO at a concentration from

about 0.1 to about 2 wt%, based on the total catalyst weight.

Claim 13. A catalyst for use in stationary or fluid bed dehydrogenation processes for converting hydrocarbons to olefins and/or diolefins, said catalyst consisting essentially of:

a carrier; chromium, as a promoter, in the form of Cr_2O_3, at a concentration from about 10 wt% to about 30 wt%, based on the total catalyst weight; zirconium, as a promoter, in the form of ZrO_2, at a concentration from about 0.1 wt% to about 15 wt% zirconium, based on the total catalyst weight; magnesium, as a promoter, in the form of MgO, at a concentration from about 0.1 wt% to about 15 wt% magnesium, based on the total catalyst weight and from about 0.3 to about 2 wt%, based on the total catalyst weight, of an alkali metal promoter, selected from the group consisting of sodium, potassium and mixtures thereof, expressed in the form of sodium oxide and potassium oxide.

Claim 14. (Cancelled)

Claim 15. A dehydrogenation catalyst consisting essentially of:

a carrier selected from the group consisting of aluminum oxide, alumina, alumina monohydrate, alumina trihydrate, transition alumina, gamma-alumina, delta-alumina, eta-alumina, bayerite, gibbsite,

nordstrandite, alumina-silica, silica, silicates, zeolites and combinations thereof, having a surface area from about 15 m^2/g to about 300 m^2/g, a pore volume from about 0.2 cc/g to about 1.5 cc/g, and an average pore diameter from about 3 nm to about 30 nm;

chromium, as a promoter, calculated as Cr_2O_3, at a concentration from about 15 wt% to about 30wt%, based on the total catalyst weight, wherein the chromium is derived from a member selected from the group consisting of CrO_3, ammonium chromate, ammonium dichromate, chromium nitrate, organic chromium salts, other inorganic chromium salts, and combinations thereof;

zirconium, as a promoter, calculated as ZrO_2, at a concentration from about 0.1 wt% to about 5 wt% zirconium, based on the total catalyst weight; and

magnesium, as a promoter, calculated as MgO, at a concentration from about 0.1 to about 2 wt%, based on the total catalyst weight.

Claim 16. The catalyst of Claim 15 wherein the chromium promoter is present at a concentration from about 17 wt% to about 24 wt%, based on the total catalyst weight.

Claim 17. The catalyst of Claim 15 wherein the chromium is added in the form of a CrO_3 solution that is impregnated onto the

alumina carrier.

Claim 18. The catalyst of Claim 15 wherein the zirconium promoter in the form of ZrO_2 is present at a concentration from about 0.5 wt% to about 1.5 wt%, based on the total catalyst weight.

Claim 19. The catalyst of Claim 15 wherein the magnesium promoter in the form of MgO is present at a concentration from about 0.5 to about 1 wt%, based on the total catalyst weight.

Claim 20. The catalyst of Claim 15 wherein the zirconium is co-impregnated on the carrier with the chromium and the magnesium.

Claim 21. (Cancelled)

Claim 22. (Cancelled)

Claim 23. (Cancelled)

Claim 24. A dehydrogenation catalyst consisting essentially of:

a carrier selected from the group consisting of aluminum oxide, alumina, alumina monohydrate, alumina trihydrate, transition alumina, gamma-alumina, delta-alumina, eta-alumina, bayerite, gibbsite, nordstrandite, alumina-silica, silica, silicates, zeolites and combinations thereof, and having a surface area from about 15 m^2/g to about 300 m^2/g, a pore volume from about 0.25 cc/g to about 0.35 cc/g, and an average pore diameter from about 3 nm to about 30 nm, wherein said carrier is spray-dried or pelletized and calcined;

chromium, as a promoter, calculated as Cr_2O_3, at a concentration from about 10 wt% to about 30 wt%, based on the total catalyst weight, wherein said chromium is derived from a member selected from the group consisting of CrO_3, ammonium chromate, ammonium dichromate, chromium nitrate, organic chromium salts, other inorganic chromium salts, and combinations thereof, wherein said chromium is added to the support in the form of a CrO_3 solution that is impregnated onto the carrier;

an alkali metal selected from the group consisting of sodium, potassium and mixtures thereof, as a promoter, calculated as sodium oxide and potassium oxide, at a concentration from about 0.3 wt% to about 2 wt%, based on the catalyst weight;

zirconium, as a promoter, calculated as ZrO_2, at a concentration from about 0.1 wt% to about 15 wt% zirconium, based on the total catalyst weight; and

magnesium, as a promoter, calculated as MgO, at a concentration from about 0.1 wt% to about 15 wt% magnesium, wherein the magnesium is co-impregnated on the carrier with the chromium and zirconium.

Claim 25. (Cancelled)

Claim 26. (Cancelled)

Claim 27. The catalyst of Claim 24 wherein the alkali metal

promoter comprises about 0.3 to about 1 wt% Na_2O, based on the total catalyst weight.

Claim 28. The catalyst of Claim 13 wherein the alkali metal promoter comprises about 0.3 to about 1 wt% Na_2O, based on the total catalyst weight.

EVIDENCE APPENDIX

There is no evidence that is attached to this Appeal Brief.

RELATED PRECEDING APPENDIX

There is no related preceding to this preceding.

Respectfully submitted,

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Dated: August 21, 2006 Holly Hart
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